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GAS ABSTRACTS

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1. GAS INDUSTRY

British Gas Education

Higgins, A. G. EDUCATION AND TRAINING. *Gas J.* (British), 275, 224-227, 231 (1953) July 22.

A description of the gas industry educational program now in operation in Great Britain. The British approach is significantly different from that in this country and worthy of consideration and comparison. R. F. Bukacek

Canadian Gas

CANADA BEST GAS SOURCE FOR PACIFIC NORTH WEST. *Can. Gas J.*, 46, 7, 8, 22-25 (1953) September.

This article, an address by an executive of the British Columbia Electric Co., Ltd., urges acceptance of conditions imposed by Canadian government which have so far blocked agreement on the export of gas from Canada to the United States. A. E. Neumann

Engineering Supervision

Willibrand, F. H. ENGINEERS AS SUPERVISORS AND MANAGERS. *Petroleum Eng., Refnc. Annual*, 25, E31-35 (1953) July 15.

In line with the trend toward emphasis on human relations in business, this article relates a little of the development of refinery engineering to spotlight the importance of supervisory skills and the problem of their attainment.

R. F. Bukacek

Fair Price Rules

Rather, C. P. HURDLES TO CLEAR IN OBTAINING A FAIR PRICE FOR GAS. *Gas*, 29, 100, 103 (1953) August.

A general review is given of the requirements of the Federal Power Commission in establishing a rate increase or in obtaining a rate for a new company. The author feels that many of the regulations could be relaxed thereby increasing the efficiency of the commission, and reducing the timidity of gas companes, who then would invest in the development of additional gas supplies. W. G. Bair

F.P.C. Control

Head, H. W. FEDERAL CONTROL CAN FLOW THROUGH GAS LINES. *Petroleum Eng.*, 25, A37-39, 42, 47, 48, 51, 53 (1953) September.

A discussion of the question of the F.P.C. jurisdictional area centered in the recent ruling of the U.S. Court of Appeals in the Phillips case. The authors point of view is adequately described in the title. B. F. Bukacek

Gas in Brazil

GASMAKING IN RIO DE JANEIRO. *Gas J.* (British), 275, 525-529 (1953) August 26.

A review of the methods of production and distribution of gas in Rio de Janeiro. The manufactured gas is a mixture of approximately 50 per cent carburetted water gas and is distributed at a calorific value of about 453 Btu per cu ft. The total daily installed capacity is 3.42 MMCF. Distribution approximates 80 per cent for domestic use, 13 per cent for commercial use and 7 per cent for industrial use.

G. V. Vosseller

Italian Gas Industry

Salimbeni, F. NATURAL GAS AIDS IN SOLVING ITALY'S INDUSTRIAL PROBLEMS. *Oil Gas J.*, 52, 129, 130 (1953) August 17.

The occurrence of natural gas in the Northern part of Italy is forecast as a solution "of Italy's industrial problems." High-quality and low-cost gaseous fuel will be channelled through a "well planned pipeline system" to the consumption areas, which are propitiously located around the gas sources and at relatively short distances. Technical-economic calculations and construction details from pipe sizes to trenching operations, are given. A.S.T.M. specifications were followed for arc welding, tests and controls. The Cortemaggiore-Turin 16-inch pipeline is the largest-sized one in Europe. Maintenance stations are connected with the main office in Milan by a micro-wave system and supplied with the most modern means for protection and safeguard. Recently two new important gas fields have been discovered near Ravenna and Imola.

S. Sensi

Lease Law

Linz, B. F. WANT TO LEASE FROM UNCLE SAM? *Oil Gas J.*, 52, 100-102, 122, 123 (1953) August 4.

Some of the regulations and conditions applicable to the leasing of public land for prospecting, development, or production of mineral deposits are set forth for prospective lessees.

R. F. Bukacek

New England Gas

GAS TO NEW ENGLAND. *Oil Gas J.*, 52, 158 (1953) September 7.

Algonquin Gas Transmission Co. began natural-gas deliveries to its New England markets September 1, marking the end of 2½ years of court battles and FPC hearings. Total cost of the completed line was over $56,000,000.

B. E. Eakin

Valuation

Terry, L. F. and Hill, K. E. VALUATION OF PRODUCING PROPERTIES FOR LOAN PURPOSES. *J. Petroleum Techn.* 5, 23-26 Sect. 1; 5 Sect. 2 (1953) July.

A method of valuation of property, whether it is purchased for cash, by direct loan or by use of oil payment, is discussed. The value of property and the loan ratio can be used as one of the criteria for judging the quality of a loan. However, no hard and fast rule can be or should be set up.

D. C. Gami

2. APPLIANCES

Burners

Flynn, J. H. RIBBON-TYPE GAS BURNER-UNIT. U. S. 2,647,569 (1953) August 4.

Handley, H. E. GAS BURNER AND SECONDARY AIR SUPPLY MEANS. U. S. 2,646,842 (1953) July 28.

Jenkins, G. F. (assigned to Minneapolis-Honeywell Regulator Co.) GAS BURNER HAVING SELECTABLE PRIMARY AIR INLETS. U. S. 2,648,378 (1953) August 11.

Morck, C. W., Jr. and Koch, T. (assigned to Selas Corporation of America). INTERNALLY FIRED GAS BURNER. U. S. 2,652,890 (1953) September 22.

Schlenk, C. F., Cheeseman, E. W. and Patrick, R. L. (assigned to Perfection Stove Co.) TOP BURNER ASSEMBLY, INCLUDING A FLASH TUBE LIGHTER FOR COOKING STOVES OR RANGES. U. S. 2,649,850 (1953) August 25.

Burner Design

Grumer, J. NATURE OF GAS BURNER FLASH BACK ON TURNDOWN. *Ind. Eng. Chem.*, 45, 1775-76 (1953) August.

An investigation of the effect of change of velocity gradient, due to over-aeration and under-aeration, upon flash-backs on turndown is reported.

J. R. Boyd

Controls and Ignition

Bodey, C. E. (assigned to Minneapolis-Honeywell Regulator Co.) GAS PILOT BURNER AND DRAFT SHIELD. U. S. 2,648,377 (1953) August 11.

Greenamyer, G. P. PILOT BURNER WITH BUILT-IN THERMOCOUPLE. U. S. 2,649,490 (1953) August 18.

Hollman, P. I. (assigned to Geo. D. Roper Corp.) MAIN BURNER IGNITION SYSTEM. U. S. 2,649,904 (1953) August 25.

Hughes, G. E. (assigned to Surface Combustion Corp.) CROSS LIGHTER AND REMOVABLE PORT-FORMING GRID. U. S. 2,652,107 (1953) September 15.

Cookers

Mayer, C. M. (assigned to The Tappan Stove Co.) GAS-FUELED BROILER BURNER FOR COOKING RANGES. U. S. 2,649,149 (1953) August 18.

A gas-fueled burner used in cooking ranges for broiling and heating the oven is described.

R. Parker

Page, I. AUTOMATIC GAS AND ELECTRIC PRESSURE COOKER. U. S. Re. 23,709 (1953) September 1.

An automatic pressure cooker, arranged to be heated by both gas and electricity, is described.

R. Parker

Heat Pump

Sporn, P. and Ambrose, E. R. PROGRESS OF THE HEAT PUMP DURING THE PAST DECADE. *Heating and Ventilating*, 50, 88-97 (1953) September.

This article covers changes in design, improvements, as well as operating data. A flow diagram commonly used in today's heat pump, a sectional view of a pump water-heater and a table for heat pump installations are included.

J. G. Chalcraft

Space Heaters

Brown, J. W. (assigned to Brown Fintube Co.) GAS BURNING HEATER WITH BACK-DRAFT DIVERTER. U. S. 2,651,299 (1953) September 8.

Jacobson, D. A. GAS FUELED RADIANT HEATER. U. S. 2,649,907 (1953) August 25.

Kent, E. (assigned to C. E. Wisner, C. J. McLeod and C. F. Brown) GAS FIRED AIR HEATER. U. S. 2,648,323 (1923) August 11.

Kent, E. (assigned to C. E. Wisner, C. J. McLeod and C. F. Brown) GAS FIRED AIR-HEATING FURNACE U. S. 2,648,324 (1953) August 11.

3. COMBUSTION AND INDUSTRIAL FURNACES

Air Pollution

AIR-POLLUTION ACTIVITIES. *Mech. Eng.*, 75, 712-714, (1953) September.

This article presents a summary of air-pollution research by a group of institutions in this country and Canada which have replied to a recent questionnaire.

D. J. Dennison

CS_2 Flammability

Zabetakis, M. G. and Jones, G. W. FLAMMABILITY OF CARBON DISULFIDE IN MIXTURES OF AIR AND WATER VAPOR. *Ind. Eng. Chem.*, 45, 2079-2089 (1953) September.

Lower limits of flammability for the system CS_2-and-water at 100°C. and 1-atmosphere pressure were determined. It was concluded that to extinguish a CS_2 vapor-air flame under all conditions (with the CS_2 initially at atmospheric pressure and 100° C) requires 4.3 lb. of water vapor per lb. of CS_2 vapor.

D. M. Mason

Fire Protection

Rossnagel, W. E. HOW WE TEACH FIRE FIGHTING TO POWER ENGINEERS. *Power Engr.*, 57, 69-70 (1953) September.

A description of a fire-fighting training course as conducted by the Consolidated Edison Co. is presented along with itemized class schedules.

E. J. Pyrcioch

FIRE RESEARCH 1952: A REPORT ON THE WORK OF THE GOVERNMENT-SPONSORED JOINT FIRE RESEARCH ORGANIZATION OF GREAT BRITAIN. *Petroleum* (British) 16, 243-248 (1953) September.

A comprehensive report on the work of the British Government fire research center. No new material has been uncovered. A large amount of work was done with foam extinguishing of petroleum fires. Ignition temperatures of various combustible construction materials were also reported. The report covers fire hazards as well as fire extinguishing.

W. G. Bair

Fuel Oil Ash

Garner, F. H., Green, S. J., Harper, F. D. and Pegg, R. E. THE METALLIC ELEMENTS IN RESIDUAL FUEL OILS. *J. Inst. Petroleum* (British) 39, 278-293 (1953) May.

Deposition of ash and corrosion, both major difficulties in the use of residual fuels in gas turbines, are due mainly to vanadium and sodium in the oil. Iron, sodium, vanadium, and nickel are the chief metals present in an Iraq residue examined, and methods have been developed for the determination of these elements in oils. Iron and sodium compounds can be removed by filtration and water-washing respectively, but vanadium and nickel compounds cannot be removed by simple means, and are present as organic compounds dispersed in the oil. Adsorbent and solvent extraction have been found to concentrate the vanadium compounds, but by both methods the maximum for an Iraq oil was only fourteen times that of the original fuel oil, viz. 0.07 per cent vanadium. Both vanadium and nickel compounds could be concen-

trated in a fraction representing about 5 per cent of the Iraq crude used and in about 20 per cent of a Venezuelan crude, and they are combined with a significant part of the asphaltenes. Previous work suggesting that all the vanadium is present as porphyrins is criticized. No method was found of preparing fuel oils free from vanadium which would be cheaper than distillation. Authors' Abstract

Ore Reduction

Totzek, F. (assigned to Koppers Co., Inc.) PRODUCTION OF IRON SPONGE FROM IRON ORE. U. S. 2,650,160 (1953) August 25.

A method of reducing sponge iron ore comprising reacting a solid carbonaceous fuel with a gas containing at least 85% oxygen at above temperatures suitable for the reduction of sponge iron ore to produce a reducing gas containing at least 70% by volume carbon monoxide and hydrogen, the preponderant proportion of said reducing gas being carbon monoxide, cooling said reducing gas to about 1000°C., contacting said reducing gas with said sponge iron ore in an amount sufficient to reduce said iron ore to at least 85% metallic iron and to produce a spent reducing gas containing substantially carbon monoxide, hydrogen, and carbon dioxide, and removing carbon dioxide from said spent reducing gas. (Claim 1.)

Totzek, F. (assigned to Koppers Co., Inc.) PRODUCTION OF IRON IN A BLAST FURNACE. U. S. 2,650,161 (1953) August 25.

Improved blast-furnace economy is claimed by replacing part of the lump fuel by a pulverized fuel and enriched-air blast, injected through a modified tuyére system. O. P. Brysch

4. CARBONIZATION AND GASIFICATION

Abstract Correction:

Gas Abstracts (1953) September, page 158, erroneously referred to an "oil-shale" retort in line 3 of the abstract of U. S. B. Mines Rept. Inv. 4957 on lignite gasification. This should read "lignite" retort.

Byproduct Recovery

Eaton, G. L. (assigned to United Engineers & Constructors, Inc.) METHOD OF COKE-OVEN BY-PRODUCT RECOVERY. U. S. 2,649,403, 404, 405 (1953) August 18.

An improved process and equipment is claimed for the recovery of by-products from coke oven gas. By inserting a naphthalene scrubber ahead of the exhauster and light oil scrubber, complete removal of naphthalene is reportedly accomplished, preventing interference with the benzene recovery system and contamination of the purified gas. In addition, by combining a small fraction of heavy carrier oil to the naphthalene wash-oil, the solution can be fractionated to separate pure naphthalene and regenerated wash-oil. The function of the heavy carrier oil is to prevent tar and pitch from polymerizing on hot surfaces in the fractionation process. The improvements are claimed in the fractionation process and in the light oil recovery system by the elimination of steam stripping. J. M. Reid

Carbon Gasification

Walker, P. L., Jr., Foresti, R. J., Jr. and Wright, C. C. SURFACE AREA STUDIES OF CARBON — CARBON DIOXIDE REACTION. *Ind. Eng. Chem.*, 45, 1703-1710 (1953) August.

Reaction rate studies on gas-baked and graphitized carbon rods using carbon dioxide indicated the velocity of the reaction increased rapidly with reaction time up to the point where approximately 10% of the original carbon was consumed. This phenomenon was attributed to a corresponding increase in surface area. The internal surface developed by chemical reactors appeared to reach an equilibrium value at which the reaction rate became constant.
C. G. von Fredersdorff

Catalytic Gasification

Riesz, C. H., Lurie, P. C., Tsaros, C. L. and Pettyjohn, E. S. PILOT PLANT CATALYTIC GASIFICATION OF HYDROCARBONS. Institute of Gas Technology (Chicago) Research Bulletin 6, (1953) July. ($5.00)

This work reports the results of a pilot plant investigation of the catalytic cracking of hydrocarbons, in the presence of steam and air, as a method of producing substitutes for various

types of utility gases, manufactured and natural. The hydrocarbons gasified in this study included natural gas, refinery oil gas, propane, butane, gasoline, kerosine, crude naphtha and light gas oil.

Data are presented on the effects of operating variables upon cracking results for these hydrocarbons, including the effects of preheat and catalyst bed temperatures, of space velocity and space-time yield, and of air- and steam-to-hydrocarbon feed ratios. The relative capacities as affected by hydrocarbon feed properties and the corresponding steam and air requirements are outlined on the basis of these data and compared with commercial operations. Commercial nickel catalysts, and one especially rugged nickel on alundum catalyst developed during the course of the study, were used, and the effects of carbon deposition, sulfur poisoning, and catalyst regeneration techniques on catalyst activity were evaluated.

The test data show that capacities and yields were both contingent upon heat transferred from the furnace to the catalyst bed. A theoretical study indicated that the quantities of heat transferred through the catalyst tube walls were dependent upon the mass velocities of the hydrocarbon-steam-air mixture passing through the tube, and that a high ratio of tube wall to catalyst volume was favorable to high capacities per unit catalyst volume. These theoretical conclusions were confirmed in the pilot plant tests by the increased yields per unit volume of catalyst when using small diameter tubes at increasingly higher mass velocities and preheat temperatures.

From computations based on the pilot plant results and interchangeability data obtained in field and laboratory tests, catalytic cracking of hydrocarbons of low molecular weight to produce a low heating value "carrier" gas, and subsequent enrichment of this carrier gas with natural gas or propane, is shown to be a means of providing base load substitutes or peak load supplements for utility systems distributing carbureted water gas, coke oven-carbureted water gas mixtures. natural gas, or manufactured gas-natural gas mixtures. Material requirements are listed for production of gases of desired compositions, specific gravities, and heating values.

The work was conducted by the Institute of Gas Technology, Chicago, under the sponsorship of the American Gas Association, with the cooperation and assistance of the Philadelphia Electric Company at the latter's Chester, Pa. station.

Authors' Abstract

Coal Research

Brown, R. L. and Ode, W. H. ANNUAL REPORT OF RESEARCH AND TECHNOLOGIC WORK ON COAL AND RELATED INVESTIGATIONS FISCAL YEAR 1952. U. S. Bureau of Mines Information Circular 7663 (1953) August.

The summary of the research and technological work on coal by the Bureau for the fiscal year of 1952 covers new mining techniques, tests and development of coking coals, coal utilization, and the production of hydrocarbons from coal. An economic analyses of the atmospheric and superatmospheric pressure entrained-coal reactor is also presented. In hydrocarbon synthesis, a review of the Bureau's studies on the Fischer-Tropsch reaction using iron catalysts is summarized. S. Mori

Hanson, E. A. CO-OPERATION: CONSULTATIVE COMMITTEE ON BROWN COAL RESEARCH AND DEVELOPMENT. *Natnl. Gas Bull.*, (Australia), 17, 29, 30 (1953) May-June.

Concerted future efforts in the development of gas, power and chemicals from brown coal in Victoria, Australia will be coordinated under a committee of the Gas and Fuel Corporation, the State Electricity Commission and the Commonwealth Scientific and Industrial Research Organization. O. P. Brysch

Coal Sampling

Bur, A. AUTOMATIC SAMPLING OF COAL AT CAR DUMPER. *Combustion*, 25, 47-49 (1953) August.

Description and comparison of an automatic sampler that samples coal as it is being dumped from the car. The sampler is rugged, simple and reasonably foolproof. G. V. Vosseller

Tomlinson, R. C. THE ROUTINE SAMPLING OF COAL. *J. Inst. Fuel* (British) 26, 83-91 (1953) August.

The principles of sampling are discussed in relation to the errors which can arise from incor-

rect sampling methods. When a coal is being sampled regularly it is possible, from the results obtained in the course of routine sampling, to plan an economical sampling scheme to give all the information required to a given accuracy. It is thus not necessary to rely on assumptions as to the sampling behavior of the coal. In order to measure the sampling accuracy, duplicate sampling should be carried out, and in order to measure the variability of the coal it is necessary to sample relatively small quantities of coal (i.e. from tens of tons rather than hundreds). After a sufficient number of samples have been taken the sampling procedure can be adjusted to give the required accuracy. The practical implications of the method are discussed in detail. Author's Abstract

Coke Oven Rebuilding

Hoskin, W. A., Black, G. H. and Godber, J. F. SOME FURTHER EXPERIENCES WITH A MODERN SILICA COKE OVEN BATTERY. *Gas World*, (British) 138, 25 (Coking Section) (1953) August 1.

Operational and engineering problems encountered in the rebuilding of a 14-year-old battery of 51 Becker ovens of the Barnsley District Coking Co. are described. Maintenance of output and handling of plant was accomplished by rebuilding in 3 separate blocks of ovens. Replacement of collecting main, offtake tees and butterfly valves, and repairs to waste gas flues are treated in considerable detail. Wear of ovensoles and impingement corrosion from liquor sprays in mains were the chief items of deterioration. O. P. Brysch

Coking Research

Jaeppelt, A. PROBLEME UM DIE BACKFAEHIGKEIT VON BRENNSTOFFEN (PROBLEMS OF THE COKABILITY OF FUELS.) *Brennstoff-Chemie*, 34, 226-32 (1953) August 19.

In addition to the bituminous coals, the coking industry is striving to convert or adapt other coals for use in coke making, and recent processes are reviewed. Basic German work on chemistry of the coking process is cited, emphasizing the existence of bitumen-forming compounds in the coking type coals, and their conversion under various conditions of heating into the evanescent products which show plasticity and decompose to form coke. Increase of cokability in younger coals by rapid heating parallels an increase in extractable bitumen content. Uusna has successfully applied this to Brux browncoals, at 20° C/min. in the Borsig-Geissen-Schwelofen. Applications of this process to coke-oven practise, and to coal briquetting are discussed. The author's work on reducing or removing the coking tendencies of coal (by oxidation or adding oxidizers) also is reviewed. O. P. Brysch

Orgztn. European Econ. Coopn. NEW COKING PROCESSES. OEEC Report No. DT/-PR/RTP/730, June 15, (1953); *Gas Times* (British), 76, 794, 95, 98-804 (1953) August 21.

A brief review and 3 tabulations of 17 processes from the OEEC report are given. Processes other than the standard coke oven method of carbonization are considered. Special emphasis is directed to the Brennstoff-Technik, the Baum and Baum-Pandinco and the Norwegian electrical processes, which are not fully developed to industrial scale. Continued research (pilot plant) on these newer methods by a Working Party is recommended. O. P. Brysch

Dust Gasification Processes

Traenckner, K. PULVERIZED-COAL GASIFICATION RUHRGAS PROCESSES. *Am. Soc. Mech. Eng. Trans.*, 75, 1095-1101 (1953) August; *Rev. gen. Gaz* (Belgian), 75, 138-39 (1953) July-August.

An upflow-type vortex gasifier having a capacity of 14 tons coal dust/day has been constructed and tested in Germany by the Ruhrgas Company. This unit operated at atmospheric pressure under slagging conditions using preheated air (1000°-1300°F) as the gasifying medium, and yielding 100 Btu producer gas at a thermal efficiency of approximately 65%. A commercial plant based on the vortex principle and designed for 100 tons coal/day is presently under construction. The author also describes a pulsatory gasifier operating with coal dust and air. This unit depends for its effectiveness on intermittent admission of the reactants, resulting in explosions at a frequency characteristic of the physical dimensions of a sonic tube. (See also *Gas Abs.*, 9, 21 (1953) February). C. G. von Fredersdorff

Holder Design

Hall, L. V. DETAILING A SPIRALLY-GUIDED GAS-HOLDER. *Gas Times* (British), **76**, 841-44, September 4; 929-30, (1953) September 18.

The details of designing spirally-guided types of gas-holders of 3 to 4 MMCF capacity are reviewed. Features of the foundations, tank, sealpipes, bracing, tank carriages and guide rails are discussed. O. P. Brysch

Oil Gas

Delsol, R., Billion, R. and Pilloy, M. APPLICATIONE DE PROCÉDÉ O.N.I.A.-G.E.G.I. DE CRACKING CATALYTIQUE DE FUEL OILS LOURDS A LA PRODUCTION A HAUT POUVOIR CALORIFIQUE. *J. usines Gaz* (French) **77**, 301-302 (1953) September; O.N.I.A.-G.E.-G.I. PROCESS FOR HEAVY FUEL OIL GASIFICATION. *Gas World* (British), **138**, 280-82 (1953) August 1: Also see—
Robertson, N. J. and Harrison, H. C. FUEL OIL GASIFICATION BY THE ONIA-GEGI PROCESS. *Gas Times* (British), **76**, 921, 22, 24 (1953) Sept. 18; *Gas J.* (British), **275**, 770-73 (1953) Sept. 23; *Gas World* (British), **138**, 777-79 (1953) September 26.

Description of a cyclic catalytic cracking process, suitable for the production of approximately 440 Btu per SCF gas from fuel oil. Operating data for a 300,000 SCF/day pilot plant are presented. H. R. Linden

Utermohle, C. E. HOW BALTIMORE HELPED DEVELOP THE HIGH-BTU OIL GAS PROCESS. *Gas*, **29**, 30-33 (1953) August.

A review of the high-Btu oil gas process in Baltimore is given, including a discussion of problems of controlling cracking conditions to produce oil gases of maximum substitutability for natural gas. The control of tar emulsion by the use of wetting agents, operating techniques, design factors and the desirable heat distribution in oil-gas tests are also considered. H. R. Linden

Peat Carbonization

Steinschlaeger, M., (England). CARBONIZATION OF PEAT WITH THE UTILIZATION OF EXCESS HEAT TO PRODUCE SURPLUS POWER. U. S. 2,650,190 (1953) August 25.

A tunnel-kiln type of plant for peat or high-moisture fuels comprising successive drying, carbonizing and quenching zones is claimed, in which the gases from carbonization are cleaned, compressed, heated, passed to a turbine, reheated and passed through a second turbine and then into the drying and carbonizing zones. The heating is done in heat exchangers by combustion gases from a pressure-gas producer.
O. P. Brysch

Producer Gas

Bass, G. O. and Milner, G. PRODUCER GAS. *Gas World* (British) **138**, (Coking Section) 43-54 (1953) September 5.

An extensive, detailed review of producer gas manufacture with emphasis directed to underfiring of coke ovens. Historical development of producer gas is traced, from Bischoff's first successful producer in 1839, through the work of Siemens, Dowson, Mond (district distribution), Kerpeley, Marischka, Hughes, Rambush, Chapman, to the modern design of Lurgi, Winkler, Pintsch-Hillebrand and Galocsy. Factors influencing operation, with growth of application of theoretical studies, are reviewed. Fuels, from rice hulls to coal and coke, are tabulated, with analyses of resulting gas. Modern producers, suction and pressure types, are discussed and illustrated. Economics of gas manufacture are treated, with Power Gas Corp. installations used as examples for several different cases of plant size and fuel quality. Costs range from 4.1 d per therm to 6.54 d per therm.
O. P. Brysch

PRODUCER GAS IN THE GAS INDUSTRY. *Gas Times* (British), **126**, 733, 734 (1953) August 7.

The development of a gas producer for the production of a high CO-low H_2 content producer gas is described. Air is supplied through a down-jet onto a fixed fuel bed resulting in high gasification rates. Slagged ash is removed at the base of the producer in solid form during shutdowns. A gas containing 1.6 to 2 per cent CO_2 and 29 to 31 per cent CO has been made. A fuel size of $\frac{1}{2}$ to $\frac{3}{4}$ in. has been used, with severe channeling being experienced in the reduction

zone with sizes below ½ in. The major problem to be solved is the elimination of clinker formation in the reduction zone. E. J. Pyrcioch

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Carbon Black

Miller, E. B. (assigned to Jefferson Lake Sulphur Company) CARBON BLACK FURNACES. U. S. 2,649,360 (1953) August 18.

Small particle-size carbon black is produced in a downdraft furnace by admitting preheated air through slotted walls of a furnace, thereby contacting preheated hydrocarbon gas. Openings in furnace walls are so designed as to allow for essentially uniform distribution of air throughout reaction chamber. M. Quinn

Schaeffer, W. D. and Smith, W. R. and Polley, M. H. STRUCTURE AND PROPERTIES OF CARBON BLACK. *Ind. Eng. Chem.*, 45, 1721-1725 (1953) August.

The changes in rubber reinforcing properties of carbon black when subjected to heat treatment are discussed. The degree of graphitization as evaluated by X-ray diffraction data was obtained, as well as the surface area and particle size of a series of blacks heated in the 1000° to 3000°C range. Tests in rubber are still incomplete. D. V. Kniebes

Compression

Kleck, C. F. HOW PEOPLES GAS USES JET COMPRESSORS FOR DISTRIBUTION PUMPING. *Gas Age*, 112, 31-34 (1953) September 10.

Jet compressors were installed at the Crawford Station of Peoples Gas Light and Coke plant to supply the distribution system with a mixed natural-manufactured gas of 900 Btu. These jet compressors were installed at a cost of $425,000 compared to a cost of $1,500,000 for reciprocating compressors. The jet compressors are capable of operating at well above calculated outputs. Maintenance and operating expense are negligible. W. G. Bair

Nunley, L. L. GAS PIPELINE HARNESSES STEAM. *Power*, 97, 73-76 (1953) September.

Single stage Ingersoll-Rand centrifugal compressors each driven by 5000-hp Ingersoll-Rand steam turbines were the choice of Transcontinental Gas Pipe Line Corporation for 3 of their 19 stations on their 30-in. Texas to New York City line. Pumping specifications are very similar to those of El Paso Natural Gas Company (see Gas Abstracts 9, number 10, October 1953, p. 176 article by Rhea and Quill) who specified 5000-hp gas turbine drive for their centrifugal compressors. Comparison of the two operations with respect to fuel and labor cost, maintenance, and flexibility of operation will be awaited by the industry. Author indicates that water availability was the important factor in locating steam stations. Steam at 625 psig and 750°F is supplied to turbines, which exhausts at 2.5-in.-mercury absolute pressure. Overall plant thermal efficiency is estimated as 21.5%. P. R. Trumpler

Condensate Recovery

Ebeling, H. O. HOW CONDENSATE RECOVERY INCREASED. *World Oil*, 137, 176, 78, 84 (1953) August 1.

The field test in S. J. Felsenthal, McGrede No. 1 lease near Longview, Texas, showed that the low-temperature separation unit with glycol injection and stabilization is more economical than the conventional low-temperature unit for producing high-pressure gas distillate wells. This modified unit increases the recovery by 22.4%. D. C. Gami

Gas Drying

Getty, R. J., Lamb, C. E. and Montgomery, W. C. DRYING NATURAL GAS. *Oil Gas J.*, 52, 132-33 (1953) August 17; *Petroleum Engr.*, 25, B7-B10 (1953) August; *Gas*, 29, 152, 4, 6, 60 (1953) October.

The testing of a new gel-type activated alumina (H-151) on Gulf Coast Gas for a 20-month period showed that the gel was still capable of adsorbing 12.5% water and retained a high crushing strength after considerable use. G. V. Vosseller

Smith, W. E. and Leva, M. GRANULAR DESICCANTS FOR DRYING LIQUIDS BY ADSORPTION. *Petroleum Processing*, 1194-1199 (1953) August.

Basic concepts of liquid drying, and the analogy between gas and liquid drying are presented. Some of the reasons for liquid drying are indicated, and general adsorbent properties are discussed. The paper also describes the adsorption regeneration cycle in the dual-type unit, and presents design details of proven standard installations. B. E. Eakin

LP-Gas in 1952

Coumbe, A. T. and Avery, I. F. LP-GAS SALES GAINED 6 PER CENT IN 1952. *Gas Age*, 112, 41-44 (1953) August 13.

LP-gas consumption gained only 6 per cent in 1952 compared with a 21 per cent increase in 1951 and 23 per cent in 1950. Sales to manufactured gas companies was down 8 per cent over the preceeding year. The bulk of the increase was for industrial and internal combustion engine fuel. Overall and consumer break-down gallonage figures are given in tabular form.
J. M. Reid

LP-Gas Handling

Turner, C. C. BASIC FACTS FOR BULK PLANT EMPLOYEES. *LP-Gas*, 13, 43-48 (1953) September.

The first of a series of 12 articles covering all phases of LP-gas bulk plant operations. This stresses the necessity of employee training and gives some ideas on methods of employee selection. W. G. Bair

LP-Gas Uses

Reimers, D. J. WHY LP-GAS HAS TWO IMPORTANT VALUES TO THE GAS UTILITY COMPANY. *Gas Age*, 112, 48-49 (1953) September 10.

Used for peak shaving, it is most economical method of improving load factor, and thus making possible lower rates from pipe lines; used for rural service, in bulk systems on a metered basis, it extends the market available to the utility and builds future load.
Author's Abstract

Network Analyzer

Chapman, F. LACLEDE'S NEW NETWORK ANALYZER STARTS ATTACKING DISTRIBUTION LAYOUT PROBLEMS. *Gas*, 29, 27-29 (1953) August; Trunk, E. F. LACLEDE APPLIES MCILROY NETWORK ANALYZER TO DESIGN CALCULATIONS FOR DISTRIBUTION SYSTEM. *Amer. Gas J.*, 179, 14, 15, 34, (1953) September; ELECTRONIC BRAIN REPORTS FOR WORK. *Amer. Gas Assoc. Monthly*, 35, 18, 19, 52 (1953) September; COLUMBIA GAS SYSTEM INSTALLS ANALYZER TO SOLVE DISTRIBUTION PROBLEMS. *Gas Age*, 112, 28-29 (1953) October 8.

The principles and method of operation of the McIlroy Pipeline-Network analyzer are described, with photographs of installations at the Laclede Gas Company, St. Louis, Mo., and the Columbia Gas System, Columbus, Ohio.
A. E. Neumann

Pipe Fracture

INDUSTRY SPURS PIPELINE TESTS. *Am. Gas Assoc. Monthly*, 35, 9, 27, (1953) September.

The steel industry, natural gas pipeline industry, and natural gas utility companies, are cooperating in a series of feld tests at Athens, Ohio, on the fracturing of large-diameter pipe operating at pipeline pressures. Information gained from the study will help pipe manufacturers and pipeline operators to improve efficiency and safety. B. E. Eakin

PIPE LINE FRACTURE TESTS START AT ATHENS, OHIO. *Gas Age*, 112, 32, 74 (1953) August 13; *Gas*, 29, 110 (1953) September.

Pipeline fracture tests to be conducted this year will be largely sponsored by the American Gas Association. The purpose of the tests will be to determine cause of line fractures, and to what extent external damage of the line influences ruptures. It is hoped welding techniques and pipe forging methods can be improved on the basis of the tests. W. G. Bair

Pressure Maintenance

Holt, W. W., Jr. MAINTENANCE EXPERIENCES WITH ELECTRICAL PRESSURE

GAGES. *Petroleum Eng.*, 25, D13, 14, 17 (1953) August.

Operational and maintenance problems encountered in the new electrical pressure transmitting system are outlined. Regulated 13 volts A. C. is supplied to strain gage pressure cells, the output of which is fed to the amplification through junction units. Amplifications employ high regenerative feed back for stability. This limits signal amplification to 5 volts measure to drive the indicating meter to full scale.

D. C. Gami

Parks, E. K. HOW NATURAL GAS USED IN PRESSURE MAINTENANCE BENEFITS GAS UTILITIES AND CUSTOMERS. *Gas Age*, 112, 21-23, 64-67 (1953) August 22.

The use of natural gas to maintain pressure in gas and oil producing fields, results in a greater oil recovery, which at the same time merely postpones, rather then reduces the availability of the natural gas. Various advantages of the pressure maintenance program are discussed and the case histories of the South Coles Levee and the Rio Bravo Fields are cited.

D. C. Gami

Sulfur Recovery

Anderson, H. M. (assigned to Tide Water Associated Oil Co.) PRODUCTION OF SULFUR FROM HYDROGEN SULFIDE. U. S. 2,650,154 (1953) August 25.

A means is claimed of regulating the flow of air so that the proper acid gas-oxygen ration will be supplied to the hydrogen sulfide combustion furnace. A small pilot stream of the produets of combustion after cooling is mixed with a pilot stream of the acid gas feed. A temperature rise or fall immediately after mixing the pilot streams indicates an excess or deficiency of oxygen, which may be remedied manually or automatically. C. E. Hummel

Mullowney, J. F. H_2S LOW BUT SULFUR RECOVERY HIGH. *Petroleum Processing*, 8, 1345-1347 (1953) September.

This 61 ton/day sulfur recovery unit recovers 92% of the available sulfur from acid gas containing 15.5 mol. — per cent hydrogen sulfide and 2.5 mol. — per cent hydrocarbons. Automatic controls permit operation of the plant by only one man per shift. Analysis of the tail gas for H_2S and SO_2 indicate the adjustments of the flow-ratio controller to be made so that the proper acid gas-air mixture is supplied to the furnace. The sulfur produced has a purity of better than 99.94%. C. E. Hummel

Underground Storage

Cunningham, M. THEY MADE THREE WELLS DO THE WORK OF 40. *Gas*, 29, 96, 98 (1953) August.

A unique storage reservoir is described which is located in the producing area rather than at the point of consumption. By storing off-season gas in a depleted field Southern Union Gas Company is able to get a high peak delivery without drilling new wells in its producing fields. In addition, since the gas is purified, the treating plant can operate a full capacity throughout the year. J. M. Reid

Virginia Gas

Young, D. M. NATURAL-GAS DEVELOPMENTS IN SOUTHWEST VIRGINIA. *Oil Gas J.*, 52, 104, 106, 109 (1953) August 24.

In Southwestern Virginia, the stratigraphy and lithology of gas reservoirs, surface and subsurface geology, and drilling and production problems differ very little from the situation in eastern Kentucky, West Virginia, and elsewhere in the Appalachian basin. Although development is in its initial stages, it is continuing at a steady pace, with developed reserves estimated at 120,000 MMCF, and proven underdeveloped reserves at 200,000 MMCF. B. E. Eakin

Wyoming Gas

GREEN RIVER . . . WYOMING'S MOST PROMISING BASIN FOR BIG GAS RESERVES. *Oil Gas J.*, 52, 100, 103, 104, 106 (1953) August 31.

The Green River Basin is being played heavily as a coming rival of the gas-producing San Juan basin. So far there are but few fields in the basin and most of these produce gas or gas-distillate. Geophysical activity was quite active in 1952, with gravimeter and seismograph being employed. A map of the area showing present fields, also tables of drilling to production data are included. B. E. Eakin

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Catalysts

Bennett, R. B. (assigned to Standard Oil Development Company). CALCIUM MANGANATE-ALUMINUM OXIDE CATALYST. U. S. 2,648,639 (1953) August 11.

The dehydrogenation of paraffinic hydrocarbon to yield olefins is improved by a catalyst consisting of 20 per cent calcium manganate and 80 per cent alumina. J. M. Reid

Engel, W. F. and Hoog, H. (assigned to Shell Development Co.) PREPARATION OF IMPREGNATED TYPE TUNGSTEN AND MOLYBDENUM CATALYSTS. U. S. 2,650,906 (1953) September 1.

An improved method is described of impregnating a combination of molybdenum and cobalt, cobalt and tungsten, and tungsten and nickel simultaneously on a foraminous carrier by means of an aqueous alkanolamine solution of water-soluble compounds of the above metals which are then calcined to oxides.

H. A. Dirksen

Johnson, H. L. and Stuart, A. P. (assigned to Sun Oil Co.) MOLYBDENUM DISULFIDE CONTAINING HYDROGENATION CATALYST. U. S. 2,649,419 (1953) August 18.

A catalyst notable for the hydrogenation of hydrocarbon oils, unsaturated hydrocarbon and aromatic constituents of petroleum fraction is claimed. The catalyst consists of from 10-25% molybdenum disulfide, 9 to 15% iron sulfide, 4-9% silica, 1 to 4% titania, and 40 to 75% alumina. The advantages claimed for the catalyst are increased mechanical strength and increased hydrogenation without cracking.

H. A. Dirksen

Desulfurization

Horne, W. A. (assigned to Gulf Research & Development Company). HYDRODESULFURIZATION PROCESS. U. S. 2,647,857 (1953) August 4.

Hydrodesulfurization of petroleum crude and naphthas with nickel or other iron group catalyst (as metal or oxide) is improved by continuing contact until a higher proportion (70-90 per cent) of the catalyst is converted to sulfide than is usual in similar processes. During regeneration by burning off carbon and sulfur with air, formation of sulfates (due to reaction of unsulfided metal or oxide with SO_2) is minimized and hence less hydrogen is required for reduction of the catalyst during production or when put back on stream. D. M. Mason

Moulthrop, B. L. (assigned to Socony-Vacuum Oil Company) TREATING HYDROCARBONS. U. S. 2,651,595 (1953) September 8.

Gasoline or other mixtures of hydrocarbons containing sulfhydryls (H_2S, mercaptans and thiophenols) can be sweetened, or the alkaline solution employed to extract the sulfhydryls from the mixture of hydrocarbons can be regenerated by oxidation of the sulfhydryls in the presence of certain metallo-organic complexes known as chelates. Iron, cobalt, nickel, or palladium salts of oxygenated chelates also are claimed. These chelates are a combination of an aromatic aldehyde having a hydroné or nitrose group substituted (rather than the aldehyde) with a di-or tri-primary amine. D. M. Mason

Fischer-Tropsch

Benedict, M., Faatz, A. C., Jr. and Woebcke, H. N. (assigned to Hydrocarbon Research, Inc.) HYDROCARBON SYNTHESIS PROCESS AND THE PRODUCTION OF SYNTHESIS GAS. U. S. 2,649,468 (1953) August 18.

Production of liquid hydrocarbons utilizing synthesis gas is described whereby the latter is produced from solid carbonaceous fuels in a Lurgi-type reactor. Specific claim is made to their reforming cycle where the tars, heavy oils, and gaseous hydrocarbons are reacted with O_2 at high temperature and pressures to get a high yield of CO and H_2. S. Mori

Gibson, E. J. THE ROLE OF ALCOHOL IN THE MECHANISM OF THE FISCHER-TROPSCH SYNTHESIS: THE DECOMPOSITION OF ALCOHOLS IN THE PRESENCE OF COBALT CATALYSTS. *J. Appl. Chem.* (British), 3, 375-84 (1953) August.

A study has been made of the effect of changes in reaction conditions on the decomposition of

n-primary alcohols over cobalt catalysts in the presence of hydrogen or mixtures of hydrogen and carbon monoxide. The increases in reaction rate with increases in temperature and space velocity are similar for the alcohol decomposition and Fischer-Tropsch synthesis reactions. With the exception of ethyl alcohol, the most stable of the alcohols, alcohols decompose in synthesis gas ($CO + 2H_2$) at 150° at a rate comparable with that of the synthesis reaction. From an examination of the products of decomposition, it would appear that the main reaction is dehydration of the alcohol. Although the formation of higher hydrocarbons by chain growth takes place during the reaction, especially in the presence of small quantities of carbon monoxide, chain growth from an alcohol which has been desorbed from the surface is not considered to be an important step in the synthesis reaction. The results are consistent with the conception that alcohols are the true primary products of the synthesis.

Author's Abstract

Fluid Coking

Weber, G. FLUID COKING: NEW TOOL FOR OLD JOB. *Oil Gas J.*, 52, 74-75 (1953) August 17; (See also: MORE GASOLINE AND HEATING OIL FROM CRUDES VIA "FLUID COKING", *Chemical Processing*, **16**, 46, 47, 50).

Coking has now become a continuous petroleum refining operation, eliminating mechanical removal of coke from drums as practiced in conventional cyclical delayed coking process. Fluid cokers will take heavy pitch hot from the bottom of the vacuum tower without further preheating. Coke instead of catalyst is the fluidized solid. No data were made available on pilot-plant results. Fluid coking should tend to render the processing of some undesirable crudes more attractive. B. E. Eakin

Gas Oil Cracking

Berg, L., Mayfield, L. G., Saner, H. A., Polich, W. F., Ennenga, B. A., Hamilton, R. B., Lewallen, L. D. and Crecelius, R. L. CATALYTIC POLYFORMING OF GAS OIL. *Petroleum Eng.*, 25, C-7-8, 10, 11, 14, 15 (1953) September.

Thermal polyforming and catalytic cracking processes have been combined into one operation where a petroleum gas oil is catalytically cracked in the presence of added hydrocarbon gases. This process is called catalytic polyforming. A series of experimental runs were carried out in pilot plant units holding 100 ml of catalyst and capable of operating at pressures up to 2000 psig in a fixed bed system. The added gases investigated were propane, n-butane, isobutane, isobutylene, and a paraffin-olefin C_3-C_4 mixed gas. The catalysts tested included Cyclocel, Filtol, HF-activated alumina, synthetic bead, chrome-alumina, silica-magnesia, and Houdry synthetic aluminum silicate. The Houdry catalyst appeared to be the most effective. Gasoline yields from the petroleum gas oil of 48 per cent per pass were obtained at 900-1200 psig at 435-465 C, 815-869 F, and a liquid hourly space velocity of 4.3 using a mixed paraffin-olefin gas mixture in a gas to oil weight ratio of 10. This compares with a maximum yield of 39 per cent gasoline per pass obtained by catalytic cracking in this unit. Octane number improvement by catalytic polyforming averaged 6-7 units higher than catalytic cracking.

Author's Abstract

Oil Supply and Demand

Spann, R. E. WORLD SUPPLY AND DEMAND. *World Oil*, 137, 59, 60 (1953) August 15.

The world supply of petroleum in 1952 exceeded the demand by 291,300 bbls./day, and is continuing to grow. The rate of demand growth has shown a substantial slow-down in recent years. It poses as serious threat to the price structure of crude in all major producing areas.

B. E. Eakin

WORLD CRUDE PRODUCTION. *World Oil*, 63, 64, 66, 68, 72, 74 (1953) August 15.

World crude production in 1952 climbed 238,346,000 bbls. from 1951 for a record of 4,515,730,000 bbls. U. S. production was up 1.8 per cent. Data on world crude oil production by areas and years is presented. B. E. Eakin

Recovery by Combustion

Kuhn, C. S. and Koch, R. L. IN-SITU COMBUSTION. *Oil Gas J.*, 52, 92-96, 113, 114 (1953) August 10; *World Oil*, 137, 184, (1953) Nov.

(See also Smith, R. L., U. S. 2,642,943); (See also: Taylor, F. B. NEW METHOD TO PRO-

DUCE OIL USES SUBSURFACE COMBUSTION. *Indep. Petrol. Assoc. Amer. Monthly*, 24, 26, 55, 56 (1953) September.)

Magnolia's Dallas research laboratory work and limited field tests indicate that a much higher percentage of low-gravity crude can be recovered from oil-bearing formations if the reservoir temperature is raised, thus reducing oil viscosity. Tests have proved that the reservoir oil can be ignited and will continue to burn in the form of a slowly advancing high-temperature front of finite thickness, as long as the necessary air flux is maintained to support combustion. The efficiency of utilization of the thermal energy produced would be exceedingly high. Recoveries of 60 to 90 per cent of the original oil in place prior to combustion, with the amount of crude burned as fuel, ranging from 2 to 15 per cent, were obtained in these laboratory experiments. Additional field testing is planned.
B. E. Eakin

Smith, R. L. and Watson, K. M. (assigned to Sinclair Oil and Gas Co.) OIL RECOVERY PROCESS. U. S. 2,642,943 (1953) June 23.

The recovery of heavy crude oils from partially depleted oil-bearing formations is improved by increasing the temperature of the formation by combustion of a portion of the oil in place. The combustion wave is continuously or intermittently generated within the formation by introduction of free oxygen (1.33 to 6%) into the gas injection stream. When a high-temperature zone surrounding the inlet well for a considerable distance has been established, fuel burning is discontinued, and the movement of the heat zone horizontally out into the formation is continued by cycling cold gas thru the inlet well.
B. E. Eakin

Well Cementing

Anderson, F. M. MODERN OIL-WELL OPERATIONS. *Cal. Oil World* 2nd issue, 46, 1, 3, 4, 6, 8, 9, 34 (1953) August.

A review of the basic reasons and procedures for cementing oil wells is presented, as well as the equipment and tools necessary to perform different types of cementing jobs. The various types of cement and their application are described, as are the various additives and chemicals commonly added to oil-well cements to impart special properties. The role of other services in securing better cementing jobs is explained, covering electric logs, radio-active logs, caliper surveys, temperature surveys, and gun perforating. The paper finally lists the steps that should be considered prior to and during a cementing job to obtain the best possible results.
Author's Abstract

Well Depth Record

DRILLING-DEPTH RECORD STRETCHED. *Oil Gas J.*, 52, 40-41 (1953) August 31; *Calif. Oil World*, 46, 1, 2, 4, 6, 8, 10, 12, 14 (1953) September.

Ohio's California wildcat is nearing a 20,600 foot depth in its test of the Point of Rocks Sand in the Eocene, and is still short of its goal.
B. E. Eakin

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Coumbe, A. T. L.P-GAS IN 1952. p. 205

Garner, F. H. METALLIC ELEMENTS IN FUEL OILS. p. 199

7. ANALYTICAL METHODS AND TESTS

Calculated Composition

Legatski, T. W. and Tooke, J. W. and Grundy, L. A. APPROXIMATING NATURAL GAS COMPOSITION. *Petroleum Refiner*, 32, 105-108 (1953) August.

A chart has been developed which predicts the hydrocarbon composition of natural gas to an accuracy of ±10 per cent for individual components and ±5 per cent for groups of components (butanes, pentanes, etc.). Specific gravity and "absorption index" are required characterization factors.
D. M. Mason

Calorific Standard

Eiseman, J. H. HOW TO OBTAIN A HIGH BTU STANDARD GAS FOR STUDYING A CALORIMETER'S ACCURACY. *Gas*, 29, 42-44 (1953) August.

Purification of methane by means of activated charcoal is described. All impurities except

0.06-0.08 per cent of N_2 and 0.01 per cent of ethane were removed. D. M. Mason

Ethylene Determination

Stitt, F., Tomimatsu, Y. and Tjensvold, A. H. (assigned to the United States of America). PROCESS FOR DETERMINATION OF ETHYLENE IN GASES. U. S. 2,648,598 (1953) August 11.

An instrument for continuous indication of low concentrations of ethylene in air or other non-reducing gas is described. Ethylene is oxidized by heated red mercuric oxide; the amount is measured from the blackening of a sensitized strip by the released mercury vapor.

D. M. Mason

Fractionation Analyses

Krause, W. F., Dystrup, A. C. and Buchanan, K. A. SAVE LTFD CALCULATION TIME WITH THESE SHEETS. *Petroleum Refiner*, 32, 115-118 (1953) August.

Standardized forms which facilitate calculation of low temperature fractional distillation analyses by clerical personnel and save operating and training time are described.

D. M. Mason

Preston, S. T., Jr. LTFD CALCULATION PROCEDURES. *Petroleum Refiner*, 32, 109-115 (1953) August.

Accurate calculation procedures, incorporating vapor holdup and gas compressibility corrections, and factors required for use of multiple receivers, are presented. D. M. Mason

Gas Sampling

Bur, A. (assigned to J. F. Robb, J. W. Robb and F. B. Robb). METHOD AND APPARATUS FOR GAS SAMPLING AND RECORDING ANALYSES AND TEMPERATURES. U. S. 2,648,976 (1953) August 18.

Samples of gaseous mixtures are taken from several points in a zone such as a furnace outlet through a movable sampling tube periodically and automatically shifted to various positions. A thermocouple attached to this sampling tube permits determination of the temperature condition existing at the time and place of sampling. C. E. Hummel

Hydrogen Determination

Turnbull, A. H. and Harrison, M. F. THE MEASUREMENT OF LOW CONCENTRATIONS OF HYDROGEN IN NITROGEN. *J. Sci. Instruments*, 30, 266-268 (1953) August.

The paper describes the development and construction of a Pirani gauge which incorporates a heated palladium "window", permitting only hydrogen to enter the gauge. In conjunction with a cooled charcoal trap, the device has been successfully used to measure low concentrations of hydrogen in nitrogen. Author's Abstract

Oxidant Determination

McCabe, L. C. ATMOSPHERIC POLLUTION. *Ind. Eng. Chem.*, 45, 111A-113 (1953) September.

Total oxidants in air (including ozone, peroxides and nitrogen oxides) are determined colorimetrically by this method based on the oxidation of phenolphthalin to phenolphthalein. Applications of this method in testing the efficiency of activated charcoal air filters and in determining atmospheric contaminants on smoggy days are described.

C. E. Hummel

pH Determination

Morton, C. THE DESIGN AND PERFORMANCE OF pH METERS. PART II. *Lab. Practice*, 2, No. 4, 180-82, 97 (1953) April.

Methods of temperature compensation and laboratory tests of the performance of pH meters are discussed. D. M. Mason

Sulfur Determination

Bethge, P. O. ON THE VOLUMETRIC DETERMINATION OF HYDROGEN SULFIDE AND SOLUBLE SULFIDES. *Anal. Chim. Acta*, 9, 129-139 (1953) August.

Volumetric methods for determining hydrogen sulfide or soluble sulfides employing iodine, sodium hypochlorite, or potassium permanganate as the oxidizing agent are discussed. It was concluded that the iodine method is the most accurate but that certain precautions in technique must be observed. An improved method for carrying out this titration is presented. When great sensitivity is required, as in micro determinations, the hypochlorite method is suggested. C. E. Hummel

Houff, W. H. and Schuetz, R. D. TWO TECHNIQUES FOR DETERMINATION OF ORGANIC SULFIDES. *Anal. Chem.* **25**, 1258, 1259 (1953) August.

Bromide-bromate titration of organic sulfides is discussed. Heterocyclic and aromatic, but not aliphatic sulfides, may be determined by iodimetric back-titration. The dead-stop-end-point method is applicable to any organic sulfide. D. M. Mason

Surface Area Determination

Fiumara, S. A. L' ADSORBIMENTO NELLA MISURA DELLE AREE SUPERFICIALI DI CORPI POROSI. (ADSORPTION AS A MEASURE OF SURFACE AREA OF POROUS BODIES). *Rivista Combustibili* (Italian), **7**, 345-391 (1953) June.

This is a historical review of the Brunauer-Emmett-Teller method which is well known. The new instrument proposed is probably of value, but does not present any special inovation. S. Sensi

Water Vapor Determination

Velling, G. BESTIMMUNG DES WASSERDAMPF-GEHALTES IN GASEN, INSBESONDERE STAUBHALTIGEN GASEN. (DETERMINATION OF WATER VAPOR CONTENT OF GASES, ESPECIALLY DUST-CONTAINING GASES). *Brennstoff-Chemie* (German), **34**, 199-205 (1953) July 15.

Water vapor in dust-laden gases is determined by taking a sample of the hot gas into a special buret, cooling the gas to condense moisture, and reading the decrease in volume. The method has been applied to gases sampled at temperatures up to 700°C., containing up to 20 g./cu.m. of dust, and leaving saturation temperatures up to 80°C. D. M. Mason

X-Ray Analysis

Buhler, J. S. PRODUCTION CONTROL TOOL — X-RAY ANALYSIS. *Can. Chem. Processing*, **37**, 66, 67 (1953) August.

The operation and the relative merits of the three methods of X-ray analysis are generalized in this article. Additional equipment, such as a line voltage stabilizer, regulator, goniometer, and the strip chart recorder, which serve to refine and obtain precision results from the equipment, is also reported. S. Mori

8. GENERAL AND PHYSICAL CHEMISTRY

Argon PVT

Whalley, E., Lupien, Y. and Schneider, W. G. THE COMPRESSIBILITY OF GASES. VII. ARGON IN THE TEMPERATURE RANGE 0-600°C AND THE PRESSURE RANGE 10-80 ATMOSPHERES. *Can. J. Chemistry*, **31**, 722-733 (1953) August.

PVT data for argon over a temperature range 0-600°C and pressure from 10 to 80 atm. have been obtained. An equation of state has been fitted to this data, and best values of the virial coefficients estimated from this and available literature data have been presented.

D. C. Gami

Carbon-Steam Catalysis

Lewis, W. K., Gilliland, E. R. and Hipkin, H. CARBON-STEAM REACTION AT LOW TEMPERATURES. *Ind. Eng. Chem.*, **45**, 1697-1715 (1953) August.

The catalytic reaction of the C-H_2O system at 1200°F for pressures ranging from atmospheric to 750 psig was studied. The carbon gasification rates based on the Arrhenius relationship for uncatalyzed reaction were much less at these temperatures than the results obtained, and the Langmuir type equation based on H_2 and H_2O retarding effect developed by Hinshelwood did nct apply to these data, so an impirical rate equation based on the retarding effect of CO has been devised. S. Mori

Carbon Structure

Walker, P. L., Jr., McKinstry, H. A. and Wright, C. C. X-RAY DIFFRACTION STUDIES OF A GRAPHITIZED CARBON. *Ind. Eng. Chem.*, **45**, 1711-1715 (1953) August.

The effect of different atmospheres on the change in the unit cell dimensions of graphite

with temperature was investigated using standard X-ray diffraction techniques. Exposure of the sample to atmospheres of nitrogen, argon, oxygen and carbon dioxide showed that the interlayer expansion was independent of the atmosphere, and linear with temperature in the investigated range from −196° to 1118°C. X-ray examination of graphitized carbon during reaction with oxygen and carbon dioxide indicate that the reacting gases do not penetrate the crystal lattice. E. J. Pyrcioch

Gas Structure

McWeeny, R. X-RAY SCATTERING BY AGGREGATES OF BONDED ATOMS. III. THE BOND SCATTERING FACTOR: SIMPLE METHODS OF APPROXIMATION IN THE GENERAL CASE. *Acta Crystallographica*, **6**, 631-637 (1953) July.

An approximate method for the calculation of the bond scattering factor of simple atoms, H_2 to Ne, appear to agree with those values obtained from a rigorous treatment which is quite long and tedious, and such method promises to reduce the time of calculation. Plots comparing both methods for 1s, 2s, and 2p functions of the electronic orbit level are presented. S. Mori

Oxygen-Nitrogen Data

Furukawa, G. T. and McCoskey, R. E. THE CONDENSATION LINE OF AIR AND THE HEATS OF VAPORIZATION OF OXYGEN AND NITROGEN. Nat. Adv. Comm. Aeronautics, Tech. Note 2969 (1953) June.

The condensation pressure of air was determined over the range of temperature from 60° to 85°K. The experimental results were slightly higher than the calculated values based on the ideal solution law. Authors' Abstract

Permeability

Ergun, S. and Owen, J. DETERMINATION OF SIZE DISTRIBUTION OF MACROPORES IN POROUS MATERIALS. *Anal. Chem.*, **25**, 1222-1226 (1953) August.

A method has been developed for the analysis of the size distribution of macropores in particles from measurements of gas flow and pressure drops. A plot of particle size against specific particle volume resulted in a number of inflection points depending on the pore distribution of the particles. Application of this method to metallurgical coke resulted in 73 to 80% of pores of macroscopic sizes. S. Mori

Wilson, B. W. THE PERMEABILITY OF BEDS OF MICROSCOPIC SPHERES. *Australian J. Appl. Sci.*, **4**, 300-315 (1953) June.

A fundamental study of the porosity of beds of particles ranging from 1.0 to 20 microns and its relationship to permeability is presented. Emphasis is laid on the forces which determine the structural arrangement in the agglomation of the particles. S. Mori

Phase Equilibria

Katz, D. L., Schatz, R. H. and Williams, B. THERMODYNAMIC DATA FOR LOW TEMPERATURE DESIGN. *Petroleum Refiner*, **32**, 101-104 (1953) August.

A brief review of the available data on vapor-liquid equilibria, densities, viscosities and thermal properties is given. Empirical methods for predicting these properties have been discussed. D. C. Gami

Reamer, H. H., Sage, B. H. and Lacey, W. N. PHASE EQUILIBRIA IN HYDROCARBON SYSTEM. *Ind. Eng. Chem.*, **45**, 1805-1809 (1953) August.

Measuring volumetric behavior as well as the equilibria composition of one of the phases, volumetric and phase equilibrium data for the system n-pentane-hydrogen sulfide covering the range from 40°F to 460°F and up to 10,000 psia are obtained. The bubble-point and dew-point states were established from the discontinuity in the first derivative of the specific volume-pressure relationship under isothermal conditions with constant composition. Also at dew points, composition of the gas phase was determined by analyzing the sample of the gas phase. Good agreement was obtained between the volumetric and directly measured compositions of the dew-point gas at states where comparison was possible. D. C. Gami

Reamer, H. H., Selleck, F. T., Sage, B. H. and Lacey, W. N. (PHASE EQUILIBRIA IN HY-

DROCARBON SYSTEMS) VOLUMETRIC AND PHASE BEHAVIOR OF DECANE-HYDROGEN SULFIDE SYSTEM. *Ind. Eng. Chem.*, 45, 1810-1815 (1953) August.

Dew-bubble points and volumetric behavior of 4 mixtures of decane-hydrogen sulfide system covering the range from 40°F to 340°F and up to 10,000 psia have been determined.

D. C. Gami

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Leck, J. H. SORPTION OF GAS IN THE IONIZATION GAGE. p. 215

Walker, P. L., Jr. SURFACE-AREA STUDIES OF CARBON-CO_2 REACTION. p. 200

9. ORGANIC CHEMISTRY

Acrylonitrile

Weith, A. J. NEW PROCESS FOR ACRYLONITRILE WILL BRING SUBSTANTIAL COST REDUCTION. *Oil Gas J.*, 52, 78, 80, 82 (1953) August 3.

A new process for the production of acrylonitrile will reduce the market price from the current 43 cents per pound to 31 cents per pound early next year. Natural gas is partially oxidized to acetylene bearing gas. This mixture is further reacted to form ammonia which in turn is reacted with additional methane to form HCN. The HCN and acetylene are finally reacted to yield acrylonitrile. A discussion of the uses as a chemical intermediate and cost consideration of the new process is given.

J. M. Reid

Cumene to Phenol

Fortuin, J. P. and Waterman, H. I. PRODUCTION OF PHENOL FROM CUMENE. *Chem. Eng. Science* (British), 2, 182-92 (1953) August.

The paper deals with the laboratory preparation of phenol from cumene. The author found that the decomposition reaction gave optimum results when carried out in a film reactor. (See also *Chem. Eng.* 60, 114 (1953) August).

W. J. Pleticka

Ethylene Production

Cornell, P. W. ETHYLENE MANUFACTURE IS BIG BUSINESS. *Oil Gas J.*, 52, 111, 113, 115 (1953) August 17.

The overall picture of ethylene production and consumption is briefly discussed including reference to the most common processes for producing and purifying ethylene as a chemical intermediate. It is concluded by the author that ethylene will remain relatively cheap regardless of the trends of the most common raw materials and that the market for ethylene products will continue to increase for the next decade.

J. M. Reid

Foster, A. L. ETHYLENE PRODUCTION METHODS. *Petroleum Eng.*, 25, C35-C36 (1953) August.

A short summary of commercial ethylene production methods is given including brief descriptions of the most significant processes.

J. M. Reid

Petroleum Aromatics

Maisel, D. S. AROMATICS FROM PETROLEUM. *Petroleum Processing*, 8, 1185-1192 (1953) August.

The various synthesis and recovery processes of aromatics from petroleum are described.

W. J. Pleticka

10. CHEMICAL ENGINEERING

Ammonia Synthesis

Slack, A. V., Allgood, H. Y. and Maune, H. E. OPERATING PROBLEMS IN AMMONIA SYNTHESIS. *Chem. Eng. Progress*, 49, 393-403 (1953) August.

Operational practice and problems in the TVA synthetic ammonia plant at Muscle Shoals, Alabama, are described. The plant of modified Haber-Bosch type, produces 125 tons NH_3 per day from synthesis gas derived from natural gas, although originally designed for 90 tons on coke synthesis gas. Problems include compressor maintenance, especially breakage of valves by water, scale and ammonium carbonates

(solved by careful filtration of gas) and corrosion by cooling water (solved by chromate treatment). Handling of the catalyst bed, including temperature control, catalyst poisons (sulfur), inert-gas bleeding catalyst disintegration are discussed from the experience with an 8-½ year run. Leakage, hydrogen corrosion, and nitriding of the plant apparatus is reviewed in detail. O. P. Brysch

Fluidization

Palmer, G. H. (assigned to The M. W. Kellogg Co.) CONTACTING GASES AND SOLIDS. U. S. 2,649,358 (1953) August 18.

The patent describes a vessel for fluidized reactions which incorporates a porous metal or ceramic filter-wall to separate the fluid solids from the exit gas stream. The filter is nonplugging up to the action of the fluidized solids on the reaction side. These solids tend to impinge and scrub any deposited solids of the filter-wall and keep it clean. W. G. Bair

Gas-Liquid Reactors

van Krevelen, D. W. and Hoftyzer, P. J. GRAPHICAL DESIGN OF GAS-LIQUID REACTORS. *Chem. Engrg. Science* (British) **2**, No. 4, 145-156 (1953) August.

For the composite process of gas absorption accompanied by chemical reaction, three dimensionless groups have been obtained by dimensional analysis to relate the following pertinent variables: rate of mass transfer, liquid film transfer coefficient, diffusivity, concentration of diffusing and inert components, and reaction rate constant. Using the functional relationship between the three dimensionless groups, derived from the two-film concept by one of the authors in a previous paper, and presented graphically in the present article, the usual graphical method for absorption-tower design is modified and applied to the design of gas-liquid reactors. Three examples are given.
S. Hu

Nitric Oxide Recovery

Pike, R. D. NITRIC OXIDE RECOVERY SYSTEM. U. S. 2,647,822 (1953) August 4.

This invention relates to the recovery of small amounts of nitric oxide from gaseous mixtures. After removal of moisture by cooling, the refrigerated gas is passed through silica gel for catalytic oxidation of the nitric oxide to nitrogen peroxide. The nitrogen peroxide is collected in refrigerated chambers and in a silica gel absorption system. C. E. Hummel

Packed Towers

Argo, W. B. and Smith, J. M. HEAT TRANSFER IN PACKED BEDS. *Chem. Eng. Progress*, **49**, 443-451 (1953) August.

A theoretical expression is derived for predicting the effective thermal conductivity in packed beds. Comparison with the available data indicates that this expression can be satisfactorily used to determine the effects of mass velocity, particle diameter, and conductivity of the solid particles on radial heat transfer in packed beds.
S. Hu

Zenz, F. A. WHAT EVERY ENGINEER SHOULD KNOW ABOUT PACKED TOWER OPERATIONS. *Chem. Eng.*, **60**, 176-184 (1953) August.

A comprehensive analysis of packed tower design and operation is presented in an extremely useful form. Experimental data for commonly used packings over varying gas and liquid rates are shown in graphical form. Design calculation procedures are outlines together with a discussion of the necessary consideration of packed tower operation. J. M. Reid

Piping Costs

Rase, H. F. TAKE ANOTHER LOOK AT ECONOMIC PIPE SIZING. *Petroleum Refiner*, **32**, 141-143 (1953) August.

A method for rapid estimation of installed piping is presented, based on an analysis of material, erection, and fabrication costs. Although not recommended for accurate cost determination, it provides a simple procedure for obtaining the magnitude of cost differential between any two sizes of installed pipe line in a process plant. Estimation procedure together with tables of material, and fabrication costs for pipe and fitting are given. J. M. Reid

Solids Feeder

Berg, C. H. O. (assigned to Union Oil Company of California). APPARATUS FOR SOLIDS

FLOW CONTROL. U. S. 2,647,587 (1953) August 4.

An apparatus is described for the feeding and flow control of granular solids through a treating column in which a gaseous or liquid fluid is contacted with the solids such as in catalytic cracking. E. J. Pleticka

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Ionization Gage

Leck, J. H. SORPTION AND DESORPTION OF GAS IN THE COLD-CATHODE IONIZATION GAUGE. *J. Sci. Instruments* (British), 30, 271-274 (1953) August.

The rate of clean-up, between 10^{-6} and 10^{-4} mm of mercury, has been measured for a variety of gases and vapors, such as nitrogen, argon and water vapor. The effect on the accuracy of the gage has been estimated. The errors introduced depend both on the design of gage and on the gas present in the vacuum system.

Author's Abstract

Mass-Rate Meter

Li, Y. T. and Lapp, P. A. NEW FLOWMETER MEASURES TRUE MASS RATE. *Petroleum Ref.*, 32, 119-125 (1953) August.

The mass flowmeter operation is based on the measurement of the moment required to apply a Coriolis acceleration to the fluid stream. Output of the meter is measured by strain-gages located on the flow-sensing element and is linear with flow. Operation is independent of pressure, viscosity, density and temperature. The instrument can be used for gas flow measurements. E. J. Pyrcioch

Pressure Measurement

Krause, L. N. and Gettelman, C. C. EFFECT OF INTERACTION AMONG PROBES, SUPPORTS, DUCT WALLS AND JET BOUNDARIES ON PRESSURE MEASUREMENTS IN DUCTS AND JETS. *Instruments* 26, 1381-388 (1953) September.

The accuracy of static-pressure measurement depends primarily upon geometry of the sensing element, geometry of the probe support, proximity effects of adjacent sensing elements on each other, and the influence of the probe on flow conditions. In many jet engine applications the influence of probe geometry and of proximity effects on accuracy may be small compared to the influence of the probe on flow conditions. Data are presented showing the magnitude of the geometry and proximity effects for commonly used probes and their influence on flow conditions in circular ducts and jets. Authors' Abstract

Strain Gages

Nolan, R. W. STRAIN GAGES. *Chem. Engrg.*, 60, 217-228 (1953) September.

Strain gages are widely used for measurement of stress and strain in fabricated structural shapes, tanks, and vessels of all kinds. More recently these gages have been applied to the measurement of pressure, weight, torque, displacement, and impact. The gage is composed of several loops of small-diameter wire which is bonded directly to the member which is being stressed or deformed. The deformation of the member causes deformation of the gage wire which changes the electrical resistance of the gage. This existance change can be measured by a Wheatstone bridge circuit. The article lists many applications of strain gages and many references to the literature. W. G. Bair

Weaver, E. A. (assigned to Comstock & Wescott, Inc.) APPARATUS FOR MEASURING THE CONTENTS OF LARGE TANKS. U. S. 2,651,939 (1953) September 15.

A pressure-sensitive strain gage is used to float on the water layer at the bottom of a liquid hydrocarbon storage tank. The gage measures the difference between bottom hydrostatic pressure and vapor pressure over the liquid by means of a vent open to the tank-top atmosphere. If the gage is mounted near the tank wall and is of like material, wall temperature effect will also be automatically concealed for. The inventor claims true readings for hydrocarbon volume irrespective of pressure, temperature and depth of water layer.

W. G. Bair

12. MATERIALS OF CONSTRUCTION

Loyd, C. C. and Whitney, J. R. CATHODIC PROTECTION OF UNDERRIVER PIPE LINES. *Corrosion*, 9, 303-306 (1953) September.

Installation of cathodic protection of the one 12-inch and six 8-inch oil pipelines which connect the Baton Rouge Refinery with the Anchorage Tank Farm was completed in May, 1951. A 100-ampere, 30-volt rectifier and groundbed were installed on each bank of the Mississippi. The groundbeds were designed to force the current to flow toward the middle of the river to secure overlapping protection. A minimum-current density of 3.5 milliamperes per sq. ft. was used for full protection. Pipe-to-soil potential measurements indicate full protection of the pipelines has been accomplished.

B. E. Eakin

Plastic Pipe Data

Kuhlmann, H. W. THERMOPLASTICS FOR PIPE. *Battelle Techn. Rev.*, 2, 82-86 (1953) August.

The major types of thermoplastic pipes are discussed with reference to physical properties, cost and use. Tables of comparative physical properties and costs are given.

G. V. Vosseller

Soil Corrosion of Alloys

HOW LOW-ALLOY IRONS AND STEELS RESIST CORROSION IN VARIOUS SOILS. *Gas Age*, 112, 47, 86 (1953) September 10.

A 13-year study by the Material Bureau of Standards on the corrosion of certain low-alloy irons and steels in soils shows that steels containing 4 to 6 per cent of chromium generally lost only about half as much weight due to corrosion as did plain steel under the same condition. The least pitting was observed on specimens containing molybdenum in addition to chromium.

E. J. Pyrcioch

13. NEW BOOKS

Catalyst Testing

TEST METHODS FOR SYNTHETIC CRACKING CATALYST. American Cyanamid Company, Refinery Chemicals Dept., New York 48pp (1953) August.

In this booklet, a group of standardized testing procedures for the measurement of some of the important properties of silico-alumina synthetic cracking catalyst are discussed. The information compiled includes determination of activity, steam and thermal stability, resistance to alteration of particle size distribution, surface area, and pore volume.

H. A. Dirksen

Steel-Making Fuel

Case, S. L., Moore, D. D., Sims, C. E. and Lund, R. J. ECONOMICS OF OPEN-HEARTH AND ELECTRIC FURNACES FOR PRODUCTION OF LOW-CARBON STEEL. (Battelle Memorial Institute): Publ, Bituminous Coal Research, Inc., Pittsburgh, Pa. 1953) July; 77pp. $10.00. (Review in Bituminous Coal Research, 13, 8-10 (1953) June-August.)

These results of a 2-year technico-economic study, sponsored by 14 electric utility companies and Bituminous Coal Research, Inc., appraise the advantages and disadvantages of the open-hearth and the electric furnace for producing tonnage low-carbon steel. Comparative costs of capacity production for modern plants (8 years old or less) in 3 sizes — 250,000; 500,000; and 1,000,000 tons per year — on a basis of complete cold metal, and 50 hot:50 cold metal, were determined from data obtained by a literature search and from steel companies, utilities and equipment builders. Detailed capacity, fuel, material, operating and cost factors are discussed with the aid of 24 charts and 46 tables. The electric furnace now shows a $2.67 — $3.20 advantage per ingot-ton, in non-integrated plants on cold metal. Present costs for 50 per cent hot metal—50 per cent scrap are so close that local conditions now might strongly influence the choice of plant for highest rate of return. Shifts in fuel costs, improved efficiencies in newer power and furnace plants, and poorer quality of fuels and charge-metal would appear to favor the electric furnace more strongly in the future.

O. P. Brysch

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